3 Methodology

The QRA was conducted by applying PHAST Risk (SAFETI) software to evaluate a series of accident scenarios involving the transportation of a unit-train of LNG in DOT-113s along mainline track routes. The objective of the analysis was to quantify the Individual Risk (IR) and Societal Risk (SR) for various populations surrounding the rail lines along 1-mile sections of track.

Engineering and administrative systems that may be employed to reduce the likelihood or the severity of releases along the route were not considered in this analysis (unless otherwise stated). The objective of this QRA study is to provide the conservative maximum baseline risk levels for transporting unit trains of LNG DOT-113 tank cars along mainline routes.

A potential incident resulting from a loss of containment of LNG would require a sequence of events to occur. QRA takes this sequence of events and assigns a frequency to the initiating event and conditional probabilities of occurrence for subsequent events. One initiating event may lead to several potential outcomes, not all of which create a potential hazard. QRA models the sequence of events through event trees with appropriate complexity to describe the most likely event outcomes. Each outcome, e.g., the consequence of a release of LNG, is then modeled to determine the impact of the flammable release event. For releases from a fixed location, the source for the release is modeled as a pseudo point source. For releases that may occur along a route, e.g., line of road for rail, the source for the release is modeled at periodic intervals along the route. In terms of a QRA for LNG transportation, only the potential flammable release hazards were evaluated for LNG. The outcome, which may be injury or fatality of onsite personnel or the public, is related not only to the physical event consequences (e.g., size of a flash fire), but also to the potentially impacted population. The PHAST Risk software incorporates the surrounding population, the phenomenological release and consequence models, event tree-derived frequencies for each outcome, and industry-accepted population impact models to calculate the IR and SR for facilities and transportation operations.

The key parameters that must be evaluated to perform the QRA, from beginning (accident occurs) to end (a potential fatality is realized), include:

1. Accident—in order for the identified consequence to occur, a vessel containing LNG must first be involved in an accident. The likelihood of an accident involving the unit train of LNG DOT-113s is estimated.

2. Loss of Containment—the hazards evaluated here concern the flammable nature of the LNG fuel vapors. In order for a fire or explosion to occur, there must be a loss of containment (LOC) event involving the LNG vessel. The LOC probabilities and leak size distributions are estimated.